PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	See Form PCT/ISA/210 (sheet 2)
Applicant's or agent's file reference R9360WO	FOR FURTHER ACTION See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/FR2004/003107	02.12.2004	04.12.2003

International Patent Classification (IPC) or both national classification and IPC
H04L1/06

Applicant
FRANCE TELECOM

1. This opinion contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP Facsimile No.	Authorized officer Telephone No.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/FR2004/003107

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/FR2004/003107

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-13	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-13	NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims		NO

2. Citations and explanations:

1. Reference is made to the following documents:

D1: LE NIR V *ET AL.*: "Reduced-complexity space-time block coding and decoding schemes with block linear precoding" ELECTRONICS LETTERS, IEE STEVENAGE, GB, vol. 39, no. 14, 10 July 2003 (2003-07-10), pages 1066-1068, XP006020635 ISSN: 0013-5194

D2: US 2003/185310 A1 (BJERKE BJORN A *ET AL.*) 2 October 2003 (2003-10-02)

2. INDEPENDENT CLAIMS 1, 12

2.1 The present application fails to comply with the requirements of PCT Article 33(1) since the subject matter of claim 1 does not involve an inventive step as defined in PCT Article 33(3).

2.1.1 Document D1, which is regarded as the prior art closest to the subject matter of claim 1, describes (the references between parentheses apply to this document):

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Method of transmitting a signal formed of vectors each comprising N source symbols to be transmitted, and implementing M transmission antennas, where M is greater than or equal to 2. The said method carries out a linear precoding of the said signal implementing a matrix product of a source matrix, formed of the said vectors organized in successive rows, and a linear precoding matrix, delivering a precoded matrix (*cf.* abstract; page 1066, column 2, paragraphs 3-5).

The organization of the said vectors in successive rows stems from the simple use of matrix calculation, and is therefore an implicit feature in document D2.

2.1.2 Consequently, the subject matter of claim 1 differs from the teachings of D1 in that: Precoded vectors corresponding to columns of the said precoded matrix are transmitted successively, the M symbols of each precoded vector being distributed over the said M antennas.

2.1.3 The problem that the present invention is intended to solve can thus be considered to be how to transmit on the M antennas the symbols having undergone the same column-wise precoding.

2.1.4 The solution, as proposed in claim 1 of the present application, is not considered to involve an inventive step (PCT Article 33(3)), for the following reasons:

In document D1, the precoded vectors obtained are combined with the space-time codes before being despatched to the antennas. The space-time coding makes it possible to best utilize the spatio-temporal diversity and is therefore adjoined to the linear precoding to increase the performance of the method. Without the space-time coding, the method in D1 would still be achievable and would be equivalent to the features defined in claim 1.

Moreover, document D2 confirms that a space-time coding is not necessary. Specifically, D2 describes (*cf.* page 4, paragraphs 52-58; figure 2) a method of precoding the transmission symbols followed by a method of orthogonalizing the precoded symbols.

Finally, it does not emerge from claim 1 in what way the additional technical features as defined in paragraph 2.1.2 would contribute to raising the performance of the method.

2.1.5 Consequently, the features described in documents D1 and D2 would be combined by the person skilled in the art, without evidencing

inventiveness, to solve the problem posed. The solution, as proposed in independent claim 1, cannot therefore be considered to involve an inventive step (PCT Article 33(3)).

2.2 Given that the device claim 12 and the method claim 1 comprise analogous features, a similar analysis applies to claim 12. Consequently, the subject matter of claim 12 is also not inventive (PCT Article 33(3)).

3. INDEPENDENT CLAIMS 5, 13

3.1 The method of reception of claim 5 states the steps inverse to those performed in the transmission direction (see claim 1). Given that this way of proceeding comes within a commonplace approach for the person skilled in the art, and that the subject matter of claim 1 does not involve an inventive step as defined in PCT Article 33(3), the same holds for the subject matter of claim 5.

3.2 Given that the device claim 13 and the method claim 5 comprise analogous features, a similar analysis applies to claim 13. Consequently, the subject matter of claim 13 is also not inventive (PCT Article 33(3)).

4. INDEPENDENT CLAIM 11

Given that the formulation of the signal of claim 11 corresponds in all aspects to the steps defined in

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

claim 1 and that the subject matter thereof does not involve an inventive step as defined in PCT Article 33(3), the same holds for the subject matter of claim 11.

5. DEPENDENT CLAIMS 2-4, 6-10

The claims contain no features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step (PCT Article 33(3)).